Exercise 2: Thinking about place – Transforming sketch maps to digital data

Lecture: How do you define place? Background materials on cognitive mapping and data development.

Description: This exercise has two parts: an activity and a lab-based exercise.

- **Activity:** Sketch maps are useful tools for evaluating geographic knowledge and assessing spatial memory. Using a blank piece of paper, each team will create a map of your 5 favorite places in Cusco. You need to include as much detail as possible so that someone unfamiliar with the city can find these places. Consider these questions with your team as you draw the map:
    - What do you need to include on your map?
    - How will you orient your map?
    - What labels and symbols will you use?

    Class discussion: Share your map with the class and discuss sketch mapping concepts.

- **Lab:** In ArcMap, use satellite imagery to locate and identify your 5 points from your hand drawn map. Create a data layer of the points on your map and add description or attribute information about those locations. We will want to standardize our information between groups so that all teams will use the same types of attribute data.

    Class discussion: What should be included in the attribute data? Coordinate data? What is located at the site? Formal name? Local name? URL?

Each group will create a data layer of their 5 points using the agreed upon categories. Additionally, each group will use the **Measure** tool to measures the distance between each point and **Buffer** to buffer a distance around each point.

The last step in the lab will be to develop a single data layer of all sites (with no duplicates) and create a map of the class's favorite places in Cusco. We will use the Geoprocessing tool, **Merge**.

- **Objective:** The objective of this exercise is to develop spatial thinking skills through cognitive mapping using sketch maps. These maps can be transformed into a digital data layer with attributes that reflect individual preferences. Students will learn to create data that is derived from their own experience.
- **Skills:** map making, imagery interpretation, digitizing, data attribute

Data: We will create our own data and share class data we create.

To start today's lab, open **ArcMap**. Click on **ArcCatalog** [icon]. A new window will open on the right of the screen. The instructor will give you directions about how and where to create a new folder where you will do your exercise.

- Create a folder: **Exercise2/**

Step 1: Finding your sites

1. Open **ArcMap**. Click on the **Add Data** button [icon], from the dropdown select **Add Basemap**. Click on **OpenStreetMap**. This will open in the Data Frame.
2. Zoom to your area of interest (AOI): *Cusco*.
3. Click on **Add Data** and select **Imagery**. You may have to zoom in and pan to see the high resolution imagery. You may have to turn off the OpenStreetMap layer or you can drag the layer so that it is below the Imagery. (**NOTE:** The layers draw in the Data Frame from the bottom up.)
4. Identify your sites. Orient yourself on the image. Zoom around the image and notice the size, shape, color, pattern, site association or proximity (what kinds of structures are associated with each other?).
5. Examine your Data Frame to see if the spatial extent captures all of your sites. Zoom and pan around to see all the sites. Think about what you can and cannot see.
6. We want to set the parameters of the Data Frame. First, give your Data Frame a meaningful name: *Cusco Favorite Locations* (right click on the **Data Frame title**, select **Properties/General**).
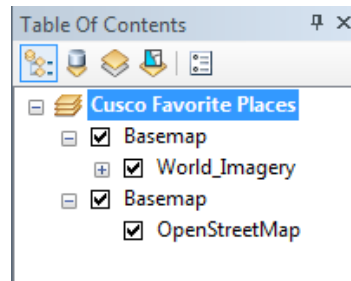

7. In the **Data Frame Properties** window/**General**, examine the **Units** option for **Display**. Notice that they are in **meters**. From the dropdown menu, select **Decimal Degrees**. The coordinates display in the lower right of the screen.
   NOTE: We are only changing the units in the Data Frame – or how we view the data.

Step 2: Creating new data -- Points

1. Right click anywhere in the menu bar of ArcMap. A dropdown list will appear with all of the extensions for ArcGIS. We are going to create data. Click on **Drawing**. (You can move the Drawing tool bar and dock it on the tool bar.) The Drawing toolbar has several tools.

   Click on the **Shapes** dropdown and select **Marker**.
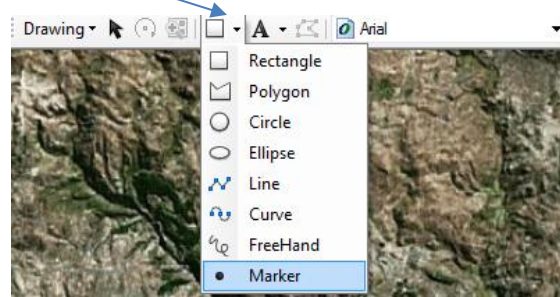
2. Click on the **Marker** icon, then zoom to your point of interest and click.

    A **Marker** should appear . Repeat this procedure for each point of interest.

3. These **Markers** are only graphics on your map. They are not geographic data that has any coordinates or attribute data. We will convert our **Markers** to feature data.
    a. From the **Menu** bar, click on **Edit/Select All Elements**. All graphics will selected.
    b. Right click on the Data Frame title **- Cusco Favorite Places**, select **Convert Graphics to Features**.
        Enter the following information. Output filename should be **Favoritesites_team#.**
        Adding your team# is important for later in the lab!
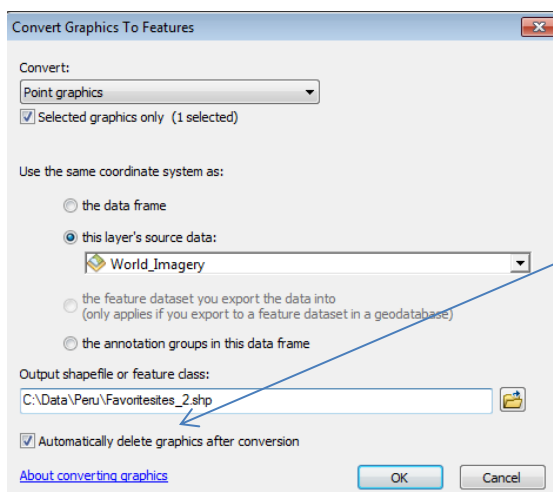
Be sure to check the "Automatically delete graphics after conversion".

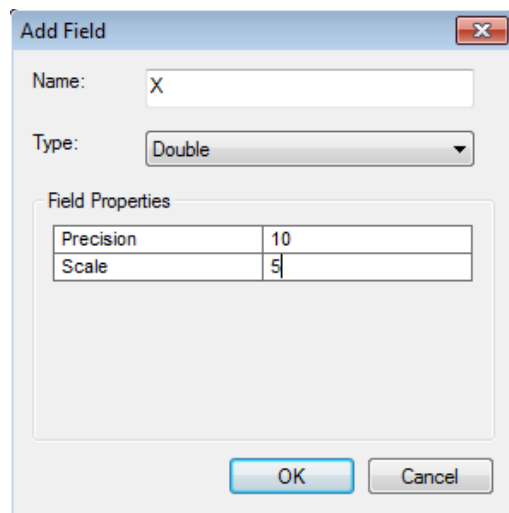**Step 3: Adding attribute data to the table**

1. As a class, we will come up with the list of attribute data to include in the table. What kinds of information might we want to include? X, Y coordinates (e.g., latitude and longitude, UTM), Name (of the site). What other types of information might we want to include? We want to be sure we all have the same table structure so that we can easily merge our data.
2. Open the **Table** (right click on the *Cusco Favorite Locations* and select **Open Attribute Table**.
3. *The Table is prepopulated with a FID (Feature Identification number), Shape (e.g., Point, Line, Polygon), and Name. Right click on **Name** and select **Properties**. What type of data is this? What does Length refer to? Click **OK**.*

4. We need to modify the table to meet our needs by adding additional attribute columns or fields. Fields are the components of a table; field names are the names of the columns. We will add at least three fields: **Rec_ no** (record number that is a unique ID), **X** and **Y** (for the geographic coordinates, such as Longitude and Latitude).

    Click on the **Table Options** ⊟ ▾ button, select **Add Field**.

    > We have to define our fields selecting what kind of information we are entering into our table.
    > **NOTE: Go to ArcGIS Resources or ArcGIS Help:** in the **Search** window, type in **ArcGIS field data types** and read about the different data types.

5. Add the **X** field. Do the same to add the **Y** field:
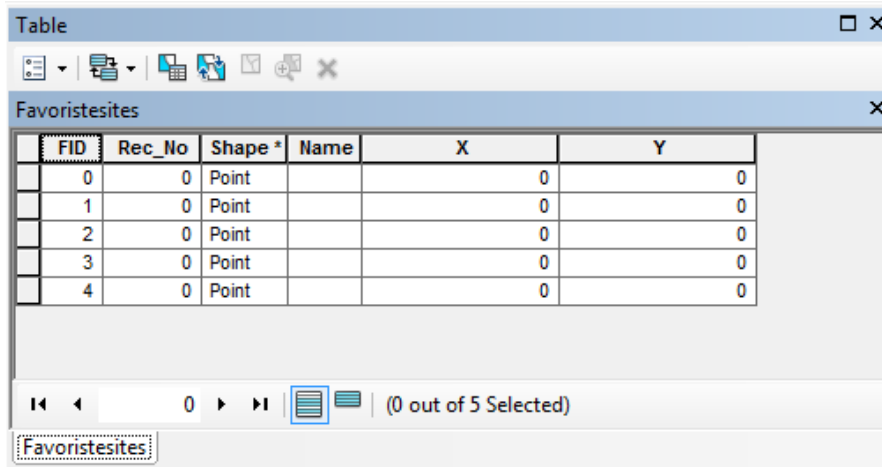

Double: a number with decimals and how it is stored in the computer.

Precision: the total numerals in a number.

Scale: the number of decimal places in the number.

6. Add the field for the **Record Number**, where **Name:** Rec_No, **Type:** Short Integer, **Precision:** 3. You can drag the **Rec_No** field to organize the sequence of your fields.
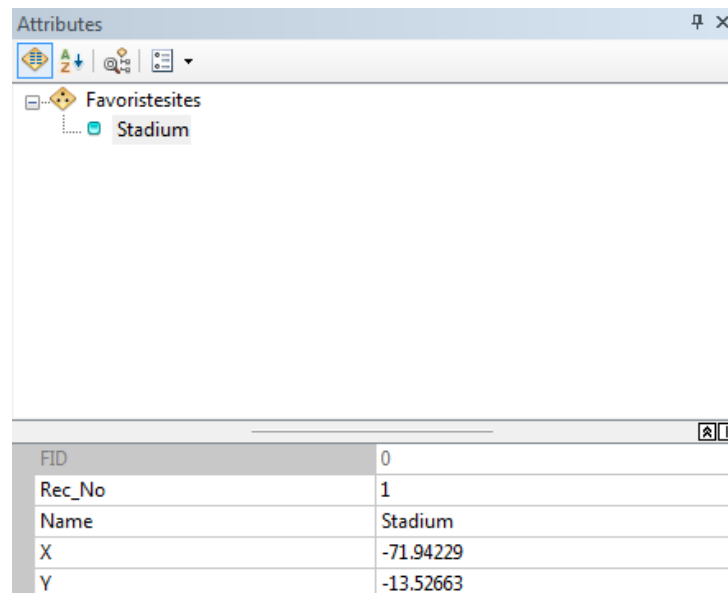
Your table should look like this:

7. We will enter data into the table. Right click on the menu bar and turn on the **Editor**. Click **Editor/Start Editing**.
8. From the **Editor** dropdown, select **Editing Windows/Attributes**. An **Attributes** window should open.
9. Select the first record in your table by clicking in the small gray box to the right of the **FID** field. This should highlight the record in the table and the record should show up in the **Attributes** window.
   You will enter the **Attribute** information. It will be different from the information below, but this is an example of the data you will enter.   Note that you will have to navigate to the selected point to find the X, Y coordinate. Be sure to enter the right value for X and Y.
   NOTE: Y measure North/South; X measures East/West.

These values will also show up in your table. Enter all the information for your points.

10. When you are done, select **Editor/Stop Editing**. Click **Yes** to **Save Edits**. Close your table and **Attribute** window.

**Step 4: Analyzing the Data: Measure and Buffer**

1. We can use some simple tools to begin to analyze the data. As a class, we will identify some ways to work with the data we have created.

2. We can measure the distance between points using the **Measure** tool on the toolbar.

   NOTE: In ArcGIS Help, read Measuring distances and areas.

3. We can use some of one of the **Geoprocessing** tools on the menu bar, **Buffer** to define a buffer around our points. *What would we use a buffer for?*

**Step 5: Creating new data: Merge**

1. We want to take all of our points and make a single dataset of the class's favorite points in Cusco. *How will we do this? How will we share the data?*
2. In ArcGIS, we can **Merge** multiple datasets of the same data type into a single dataset.

3. In the **Menu** bar, click on **ArcCatalog**   . **Copy** and **Paste** the shapefile **Favoritesites_team#** into the folder: **CuscoWorkshopData/SharedData**. This way everyone can access everyone's data.
4. Once all teams have put their data to that folder, copy that folder to your working directory: **Exercise 2**.
5. In the **Menu** bar, click on **Geoprocessing/Merge**. Click on the **Tool Help** to read about what **Merge** does. In Input Datasets, include all the team Favoritesites_team# shapefiles.
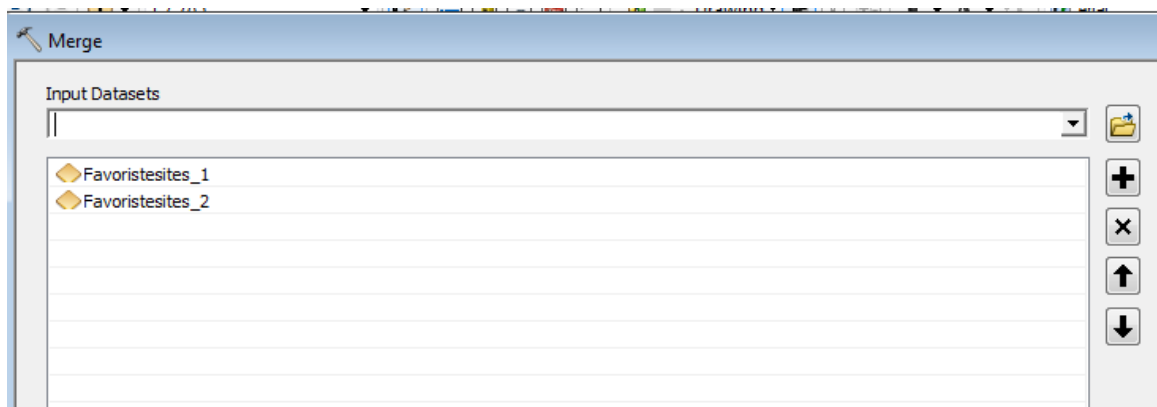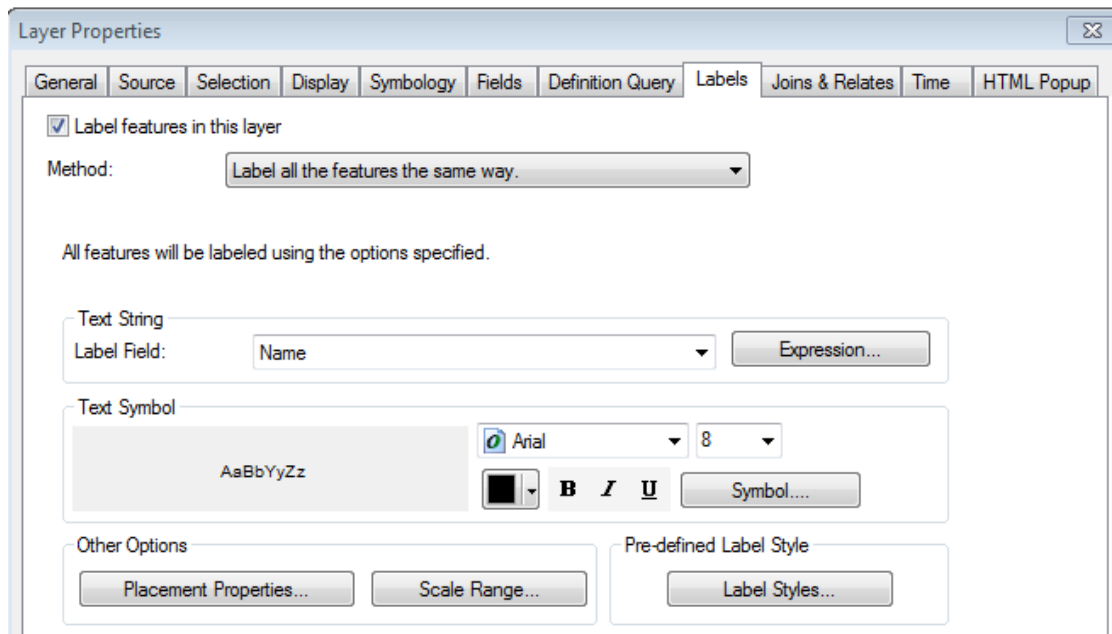

   Click **OK**.
6. A new shapefile will added to your **Table of Contents**. Give it a meaningful name: **Class Favorite Sites in Cusco.**

7. *Open the attribute table for Class Favorite Sites in Cusco. Examine the table. What do you notice about the table?*

8. You will have to clean up the table so that it doesnot have fields with null values. The new table has an **ObjectID** field. You can delete the **Rec_no** fields by rightclicking on the **Rec_no** field and select **Delete Field**.

9. Further examine all of the points and identify any duplicates – those points that identify the same location. You will need to remove these as well. Select **Editor/Start Editing**. Select the point to be removed by clicking in the box to the right of **ObjectID**. Right click on that box and click on **Delete Selected**. **Stop Editing. Save Edits.**
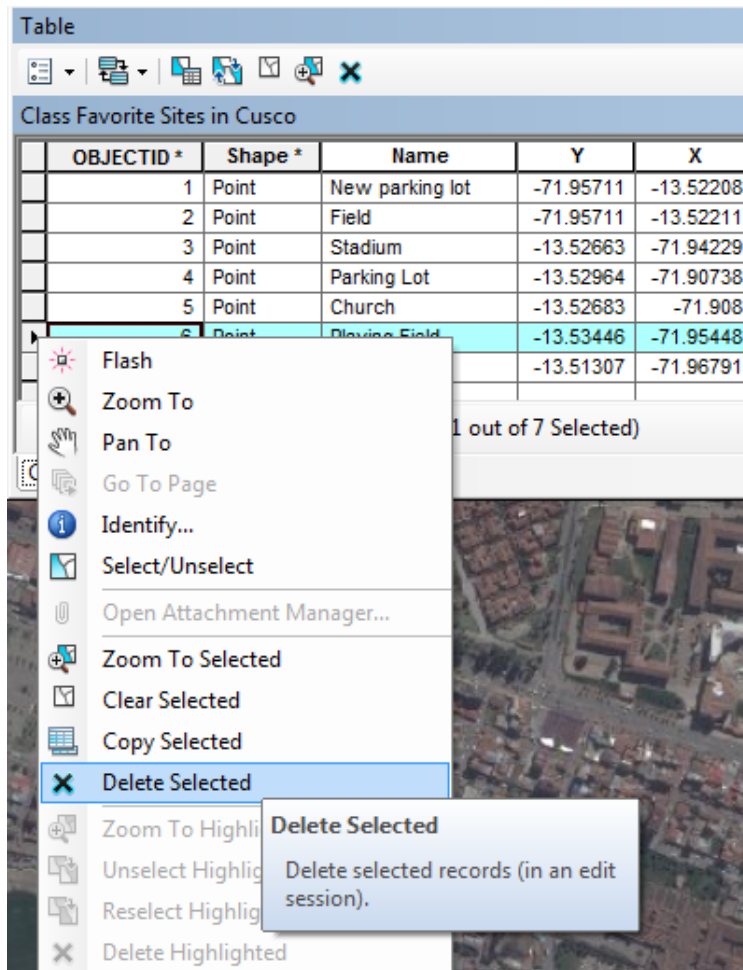

10. Close the table.

11. Right click on Class Favorite Sites in Cusco. Select **Label Features**. The **Labels** should show up in the **Data Frame**. Right click on Favorite Sites in Cusco, select **Properties/Labels**. You can make changes to the way the labels are displayed.

Step 6: Make a map

1. Make a map using a preexisting template. In the Menu bar, click on **View/Layout View**.
2. Right click anywhere on the tool bar and turn on the **Layout** by checking the box next to it. Dock the **Layout** tool bar to the **Menu** bar.

3. Click on the **Change Layout** button . Scroll across the top and select the **Traditional Layouts**. Select Letter Landscape and add your title. You may want to change the background to OpenStreetMap or some other base layer where you can see the labels better.
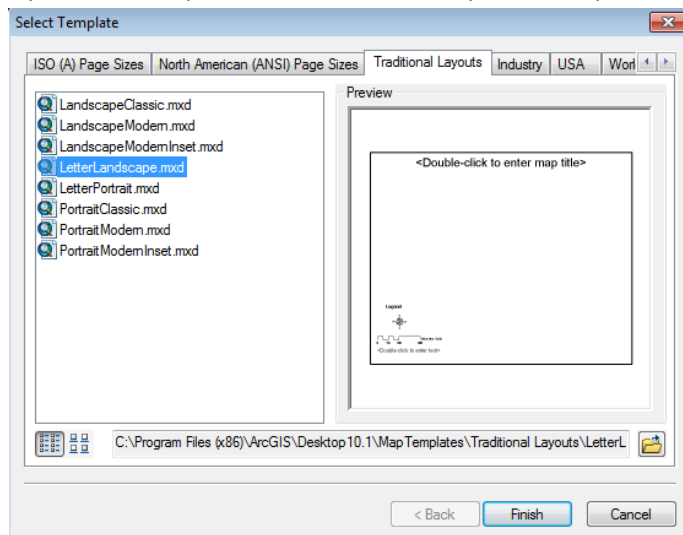
4. Examine your map. Compare your map with other teams.
5. Save your project.

Congratulations! You have completed Exercise 2, created new data and made a new map.

Challenge Activity: Further refine the map to include other important sites of the city that are missing. Or, reorganize the data you have from the class to create a different map – selecting only one type of information. Or create your own map of whatever you choose.